CHAPTER 2: LITERATURE REVIEW AND BACKGROUND

The design of drilled shaft bents should be viewed in the context of the larger bent-type substructural elements, in general. Similarly, the bent is a single element in the larger bridge system that includes the substructure elements, abutments, bearing pad connections, girders and a deck. This chapter will include a summary of previous work on the response of bridge bent foundations and point of fixity, as well as selected work performed by others on the subject.

Pile Bent Project

In 2006, a final report was issued for the NCDOT sponsored Project 2005-19, "Pile Bent Design Criteria." Some of the work performed for the current study builds off the results presented in the 2006 report. A brief review of the approach and significant findings are presented here; the interested reader is referred to the original report for further details.

Pile bents, like drilled shaft bents, are substructure units constructed by installing one or two rows of driven piles, then connecting them with a cast-in-place concrete bent cap. Once the abutments and bents are constructed, girders are placed to ultimately support the bridge deck. Most pile bents in North Carolina have elastomeric bearing pad placed at support points of the girders.

In general, NCDOT pile bent design is performed using frame analysis. In this case, the Geotechnical Unit estimates the foundation size from axial geotechnical analyses, as well as a "Point of Fixity" from single pile lateral analyses; buckling considerations are included using estimated lateral and axial loads. The point of fixity allows the designer to idealize the pile-soil system as a fixed base cantilever column without additional soil resistance. This cantilever column then forms the basis for elastic frame analyses, which in turn can be used to verify the size and reinforcement requirements for the bent cap given a superstructure design. The elastic frame also verifies if piles are sufficient from a structural standpoint.